REMARKS

Claims 4-8 and 12 were previously cancelled. New Claims 16 and 17 were previously added. Accordingly, Claims 1-3, 9-11 and 13-17 are pending.

An unexecuted 1.132 Declaration by Dr. Buwalda accompanies this Amendment. An executed declaration will follow shortly. Additionally, five new references and an Information Disclosure Statement are enclosed.

Substance of the Interview

Applicants wish to thank Examiner Tran for granting an interview, which took place at the U. S. Patent and Trademark Office on October 17, 2006. Representing the applicants at the interview were Mr. Koen Bijvank, Dr. Cindy Semeijn, Mr. Kees van Woerkom and the undersigned. The examiner's courtesy during the interview was much appreciated. A summary of the interview, and the reasons for patentability of the present claims provided at the interview, follow.

Applicants began the interview by explaining the present invention. The invention provides heated-expanded foodstuff with a surprisingly high degree of expansion. The method comprises heating foodstuff which comprises non-cereal amylopectin starch, such as potato amylopectin starch, to a temperature above the glass transition temperature of the starch. After a surprisingly high degree of expansion, the foodstuff is cooled.

Applicants then discussed certain physical properties of starch, in particular, the property of viscosity. The viscosity of amylopectin potato starch is much greater than natural potato starch and waxy grain starch. As evidence, applicants referred to a reference cited by the examiner, U.S. Patent No. 6,488,980 (Jeffcoat et al.). In particular, applicants pointed to col. 4, lines 18-22, of Jeffcoat et al. There it is stated that "modified waxy potato starch has

an unexpectedly high viscosity...at least fifteen times that of the modified starch prepared from common (non-waxy) potato starch."

Applicants then stated that it is generally understood by those skilled in the art that the viscosity of a composition and the ease with which the composition can expand are inversely related, i.e., the more viscous a composition is, the more energy is needed to expand the composition.

Applicants explained that this phenomenon can be witnessed in daily life. Applicants described bubble gum as an example. Initially, bubble gum is very viscous and it is virtually impossible to blow a bubble with the gum. However, after chewing the gum for a while, the gum becomes less viscous, and it is possible to blow a bubble with the gum. Applicants also used batter as an example, i.e., as the viscosity of batter increases, it takes more energy to whip the batter.

Applicants then referred to the 1.132 Declaration filed on December 28, 2005 in which the equation relating viscosity and expansion was provided. In particular, the equation for bubble growth rate (i.e., expansion) is as follows:

$$dR/dt = R\ddot{A}P/ç$$

where R, ç, and ÄP are respectively the bubble radius, melt viscosity, and the vapor pressure difference between the interior of a bubble and the surroundings (Kokini et al., "The role of rheological properties on extrudate expansion," Food Extrusion Science and Technology (J.L. Kokini, C.T. Ho, M.V. Karwe, Eds.), Marcel Dekker, New York (1992), p. 631-652).

Applicants then stated that a skilled artisan would be familiar with the inverse relationship between viscosity and ease of expansion, and thus would have believed that a more viscous starch would expand to lesser degree *vis-à-vis* a less viscous starch when using the same amount of expansion energy. In particular, since amylopectin potato starch is much more viscous than natural potato starch, a skilled artisan would have believed the

amylopectin starch would expand less than the natural starch when using the same expansion energy.

Dr. Semeijn then discussed her experience at AVEBE (i.e., Dr. Semeijn's employer and the assignee of the present application). Dr. Semeijn and her colleagues were given the task to produce puffed snack products with amylopectin potato starch. She and her colleagues objected stating that such a task would not provide a desirable product. That is, since amylopectin potato starch is much more viscous than natural potato starch, it was believed that the resulting snack product would not have the desired volume of expansion.

However, once the experiments were done, it was surprisingly found that not only did the amylopectin potato starch expand as much as the natural potato starch in response to heating, but the amylopectin potato starch expanded much more than the natural potato starch. Such a result was contrary to the predictions. Dr. Semeijn showed the examiner samples of peanuts coated with amylopectin potato starch and peanuts coated with the natural potato starch. Both peanut samples were exposed to the same amount of heat. Clearly, the peanuts covered with the amylopectin potato starch had a much greater volume than the peanuts coated with natural potato starch.

Dr. Semeijn then spoke about the advantages of using a starch that has the property of ease of expansion. Firstly, a lower temperature can be used when heat-expanding the amylopectin potato starch. At a lower temperature, less impurities are produced, such as, for example, carcinogenic acrylamides. Additionally, using a lower temperature extends the life of the frying oil thus being more economical and more environmentally friendly. Secondly, a starch that has the property of ease of expansion allows for the production of a more aerated starch product. Accordingly, less starch is used to provide the same volume. Thus, the carbohydrate content of the foodstuff is reduced.

Dr. Semeijn also discussed the commercial success of the foodstuff using amylopectin potato starch. Since the introduction of foodstuff using amylopectin potato starch, sales of AVEBE increased from 50 tons of product to 3000 tons of product, of this amount 1000 tons consist of snack foods.

The examiner stated that she would consider the showings made at the interview. Also, the examiner suggested that applicants provide references showing that the equation for bubble growth rate specifically applies to starch, and what the teaching in the art was regarding the relationship between starch viscosity and expansion before the present invention.

References Requested by the Examiner

Pursuant to the examiner's request, applicants have enclosed references showing that the equation for bubble growth rate specifically applies to starch, and what the teaching in the art was regarding the relationship between starch viscosity and expansion. In particular, accompanying this Amendment are two references Kokini et al. ("The Role of Rheological Properties on Extrudate Expansion" Food Extrusion Science and Technology, J.L. Kokini, C.T. Ho, M. V. Karwe, Eds. 1992, 631-652) and Valle et al. ("Relations between Rheological Properties of Molten Starches and their Expansion Behavior in Extrusion," *Journal of Food Engineering* 1997, 31:277-295).

Kokini et al.

Kokini et al. is a chapter in a book reviewing the state of the art teaching pertaining to expansion properties of food extrudates, including dough. Beginning on the bottom of page 632, is a section entitled "Theorectical Considerations in Bubble Growth Dynamics." Within this section, on page 634, second full paragraph, below equation 3, Kokini et al. concludes: "The expansion then can be assumed to be controlled by $\Delta P/\eta$." ΔP is the difference between

the pressure inside the bubble and the pressure of the surroundings. The variable η is the shear viscosity of a doughy mass. Accordingly, the state of the art teaching in 1992 was that the expansion of a doughy food product was inversely related to its viscosity.

On page 647, middle of paragraph, Kokini et al. confirms the inverse relationship applies to starch. In particular, Kokini et al. states: "The viscosity of the doughy mass in the die was calculated using the empirical equations presented earlier. Poor expansion can be observed at all moisture contents as the viscosity becomes higher."

Also, in the first paragraph, on page 632, Kokini et al. indicates that the state of the art is that "native starches having 50% amylose levels expanded best." Such a teaching is in direct contrast with the present invention which teaches using virtually all amylopectin root starch for maximum expansion.

Valle et al.

In the first sentence of their Abstract, Valle et al. summarize their study as follows:

> Starches with various amylose contents were expanded by extrusion through a specific slit die rheometer. At a given moisture content and temperature, volumetric **expansion** *increased* as melt **viscosity** *decreased*. (Emphasis added.)

Thus, the state of the art in 1996 was that starch expansion and viscosity were inversely related.

On page 278, last paragraph, Valle et al. mention the Kokini et al. equation which demonstrates the inverse relationship of viscosity and expansion.

On page 283, last paragraph, Valle et al. state that a typical volume expansion index (VEI) as a function of melt viscosity is presented in Figure 5. They conclude that "The

strong negative influence of melt viscosity is confirmed..." Valle et al state that their finding is in agreement with other studies, including Kokini et al. This inverse relationship is easily discernable from Figures 5 and 6.

Additionally, in their Abstract, Valle et al. state: "At any temperature and moisture content, volumetric expansion increased with amylose content." Thus, in direct contradiction to the present invention, Valle et al. teach that expansion can be increased by adding amylose. On page 288, second paragraph, Valle et al. state that maximum expansion was found at an amylose content of 50%.

Conclusion

Accordingly, pursuant to the examiner's request, applicants have shown that before the present invention, the teaching in the art was that the equation for bubble growth rate specifically applied to starch, and that there was an inverse relationship between starch viscosity and expansion.

Thus, the present invention directly contradicted the state of the art. That is, it was surprising that a more viscous starch resulted in greater expansion. In particular, amylopectin root starch is 15 times more viscous than native potato starch yet yielded a more highly expanded food product. In fact, according to the experimental results in the specification, amylopectin potato starch yielded a foodstuff that was at least 15% more expanded than a foodstuff comprising a composition of native potato starch. See Claims 16 and 17.

Additionally, Valle et al. and Kokini et al. report that the state of the art before the present invention was that for maximum expansion, amylose starch content should be at 50%. Again, such a teaching is in direct contrast with the present invention which requires at least 90 wt. %, more preferably at least 95 wt.%, most preferably 98 wt.% or 99 wt.% amylopectin root starch. See page 3, lines 22 to 26, of the specification.

Rejection under 35 U.S.C. § 103

The examiner has rejected Claims 1-3, 9-11 and 13-17 as being obvious over U.S. Patent No. 4,409,250 (van Hulle et al.) in view of U.S. Patent No. 6,488,980 (Jeffcoat et al.).

The examiner maintains that van Hulle et al. disclose methods for preparing puffed snack products "from gelatinized doughs whose total amylopectin starch content ranges between about 30-95%." (See Office Action page 2, last paragraph.) The examiner concedes that "[v]an Hulle et al. do not disclose the amylopectin starch is non-cereal amylopectin starch..." (See Office Action page 3, 1st paragraph.) In an attempt to remedy this deficiency in van Hulle et al., the examiner states that Jeffcoat et al. disclose cross-linked waxy potato starch.

Applicants disagree with the examiner's analysis. First of all, van Hulle et al. do not teach that high amylopectin starch is preferred over other types of starch for use in their methods. As pointed out by the examiner, "in a highly preferred embodiment" van Hulle et al. teach using "doughs whose total amylopectin starch content ranges between about 30-95%" (col. 4, lines 53-55). Thus, van Hulle et al. include starches with an extremely low level of amylopectin in their preferred embodiment, i.e., amylose starch. Thus, there is no motivation to combine the method of van Hulle et al. with a starch with a high amylopectin level, let alone the amylopectin starch disclosed in Jeffcoat et al.

There are additional reasons why a skilled artisan would not have combined the teaching of van Hull et al. with Jeffcoat et al. Jeffcoat et al. teach that amylopectin potato starch has an unexpectedly high viscosity, i.e., "at least fifteen times that of the modified starch prepared from common (non-waxy) potato starch."

As demonstrated in the "References Requested by the Examiner" section, the state of the art teaching at the time of the present invention was that the viscosity of a starch and its expansion were inversely related. Thus, a skilled artisan would not have used a more viscous starch (i.e., amylopectin potato starch) vis-à-vis a less viscous starch (i.e., amylopectin cereal starch) when a product with increased expansion was desired. Thus, Jeffcoat et al. teach away from using amylopectin potato starch in the methods of the present invention.

In the December 28, 2005 Amendment, applicants asserted that Jeffcoat et al. disclose that amylopectin potato starch derivatives are much higher in viscosity than waxy maize derivatives, and thus a skilled artisan would not have used amylopectin potato starch if expansion of a product was desired. In response, the examiner states that "the statement made in the declaration is contradicting to [sic] what is claimed and argued by applicant. The declaration states that the starch disclosed by Jeffcoat et al. has reduced expansion; however, the starch is the same type of starch claimed and disclosed." (Office Action page 5, 1st paragraph.)

The examiner has misinterpreted the applicants' December 28, 2005 assertion. That is, because Jeffcoat et al. taught that amylopectin potato starch was very viscous, it is **surprising** that amylopectin potato starch would provide a more expanded product. Accordingly, the present invention is surprising and novel.

The examiner also states that "The declaration shows that cross-linked amylopectin potato starch give [sic] high expansion index than native amylopectin potato starch and waxy maize starch. The showing is not commensurate in scope with the claims because the claims only recite non-cereal amylopectin starch." (Office Action page 5, 1st paragraph.) However, the declaration shows that both amylopectin potato starches give a higher expansion than the cereal amylopectin starch. Thus, applicants do not understand the examiner's comment.

The examiner also states that the results shown in Table 2 of the specification are "not conclusive." The examiner seems to believe that other parameters are varied besides the type of starch used in the examples. For example, the examiner states that "The presence of sodium bicarbonate and acid sodium pyrophosphate will also affect expansion." (Office Action page 5, last paragraph.)

Besides the type of starch, the other parameters varied in Table 2 are the type and amount of cross-linking agents, starch amount, and amount of water used. The levels of sodium bicarbonate and acid sodium pyrophosphate were the same in the results shown in Table 2. See Example 5, page 11, lines 13-18. See paragraph 4 of Dr. Buwalda's declaration.

Examples 5, 8, 9 and 10 use amylopectin potato starch; whereas, Examples 7 and 11 use natural potato starch. Example 11 differs from all in other examples in that more water was added to the natural potato starch in order to encourage expansion.

All of the examples in Table 2 which use amylopectin potato starch provide a more expanded product than the examples which use natural potato starch (including Example 11 which had the added water). Applicants direct the examiner's attention to Examples 7 and 9. These examples both use the same amount of cross-linking agents. Example 9 using amylopectin potato starch provides approximately 34% greater expansion volume than Example 7 using natural potato starch.

Thus, Table 2 provides working examples of how replacing natural potato starch with amylopectin potato starch significantly increases expansion of foodstuff. Also, accompanying this Amendment is a photographic demonstration (Exhibit A) showing how replacing native potato starch by increasing levels of amylopectin potato starch (Eliane ™) yields the unexpected expansion of the present invention. Exhibit A was presented to the examiner during the interview.

In summary, from the teaching of Jeffcoat et al. and from the general teaching in the art at the time of the present invention, it would have been expected that use of an amylopectin potato starch in the procedure of van Hulle et al. would have led to reduced expansion when compared to the use of natural potato starch. Accordingly, the present invention is in direct contrast to what would have been expected.

Additionally, independent Claim 9 recites a heated-expanded foodstuff comprising a non-cereal amylopectin starch. As discussed above, neither van Hulle et al. nor Jeffcoat et al. disclose the preparation of compositions as described in the present application. Thus the cited prior art references cannot disclose the heat-expanded non-cereal amylopectin starch foodstuff products of the present invention.

Accordingly, applicants request that the obvious rejections be withdrawn.

Applicants believe that the rejections are overcome by the above showings. However, applicants take this opportunity to make a further showing that skilled artisan would have expected that amylopectin potato starch used in the method of van Hulle et al. would result in **reduced** expansion rather than the increased expansion that was found in accordance with the invention. In particular, a reference entitled "New Possibilities with Amylopectin Potato Starch" by De Vries, accompanying this Amendment, makes such a showing. A detailed discussion follows.

One of the features of the present invention is that the use of amylopectin potato starch provides an unexpectedly **increased expansion** in foodstuff. On the other hand, de Vries states:

> [T]he use of amylopectine potato starch leads to **less expansion** after frying. This can lead to better control of the expansion process. (1st full paragraph on p. 9. Emphasis added.)

Thus, if a skilled artisan would have wanted to produce a potato foodstuff with greater expansion, de Vries would have led him away from using high amylopectin potato starch.

Accompanying this Amendment is a 1.132 Declaration by Dr. Buwalda. He explains the text in de Vries:

> De Vries is a general overview of potential applications of isolated amylopectin potato starch. De Vries article compares the characteristics of amylopectin potato starch and natural potato starch. (Section 3 of the Declaration.)
>
> The statement "the use of amylopectine potato starch leads to *less expansion* after frying" is a statement regarding a comparison between a product made of amylopectin potato starch and a product made of natural potato starch. In particular, De Vries teaches that use of amylopectin starch in a snack product yields a *less expanded* product as compared with the use of natural potato starch. (Paragraph 3 of the Declaration.)

Apparently, DeVries did not produce the amylopectin snack product evidenced by the fact that he did not observe the increased expansion. The statements in the article are based on an incorrect theory which was the state of the art in 1995. (See "References Requested by the Examiner" section above for a detailed account of the state of the art at the time of the present invention.)

Rejection under 35 U.S.C. § 112

The examiner rejected Claims 16 and 17 under 35 U.S.C. § 112 as containing "subject matter which was not described in the specification..." (Office Action page 2, 1st paragraph.) In particular, the examiner objects to the "consisting essentially of" language.

Applicants respectfully disagree with the examiner. The "consisting essentially of" language is supported by the specification, as explained below.

The transitional phrase "consisting essentially of" limits the scope of a claim to the specified materials "and those that do not materially affect the basic and novel characteristics" of the claimed invention (MPEP§2111.03).

The basic and novel characteristic of the present invention is the surprising degree of expansion of foodstuff using amylopectin potato starch versus natural potato starch. It is clearly indicated throughout the specification that adding natural potato starch or cereal starch to a composition consisting essentially of amylopectin potato starch would reduce the expansion of a foodstuff.

For instance, Table 1, on page 10, provides working examples. Example 1 contains natural potato starch and waxy maize starch. In Example 2, the natural potato starch is replaced with amylopectin potato starch. The volume of expansion in Example 2 is about 13% greater than that of Example 1.

Example 3 contains amylopectin potato starch and waxy maize starch. In Example 4, the waxy maize starch is replaced with amylopectin potato starch. The volume of expansion in Example 4 is about 25% greater than that of Example 3.

Additionally, literal support for the "consisting essentially of" language can found throughout the specification, including, for example, in the sentence bridging pages 3 and 4. There it is stated that "only water need to be added for preparing the [composition], said composition *optionally* containing other starches..."

Accordingly, applicants request withdrawal of this objection.

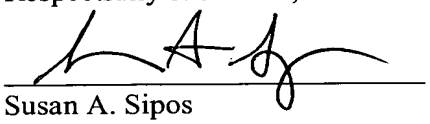
Also note, Claims 16 and 17 recite a degree of expansion as suggested by the examiner. (June 29, 2005 Office Action page 4, 1st paragraph.) In particular, these claims

recite a foodstuff comprising a composition, wherein said composition consists essentially of a non-cereal amylopectin starch having an amylopectin content of at least 90 weight percent "wherein said heat-expanded foodstuff is at least 15% more expanded than a foodstuff comprising a composition consisting essentially of native potato starch obtained by the same method."

Support for these claims can be found throughout the specification. For example, the phrase "wherein said heat-expanded foodstuff is at least 15% more expanded than a foodstuff comprising a composition comprising essentially of native potato starch obtained by the same method" is supported by Table 2.

Applicants respectfully submit that the application is in proper form for allowance, which action is earnestly solicited. If resolution of any remaining issue is required prior to allowance of this application, or if the examiner has any suggestions for an amendment, it is respectfully requested that the examiner contact applicants' undersigned attorney at the telephone number provided below.

Respectfully submitted,



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